METHOD FOR CONTROLLING TRANSMISSION POWER

FIELD OF THE INVENTION

The present invention relates to a method of controlling transmission power of a first station, in particular, but not exclusively a mobile station. The present invention also relates to a station for example a mobile station.

BACKGROUND TO THE INVENTION

The use of code division multiple access (CDMA) is being proposed for the next generation of cellular telecommunication networks. Additionally, code division multiple access is also being used in the IS-95 Standard in the USA. CDMA is a direct sequence spread spectrum technique. In a wireless cellular network using CDMA, the mobile terminals in one cell associated with a first base station will use the same frequency as mobile stations in an adjacent cell associated with a second base station. The different mobile stations can be distinguished by the respective base stations as each mobile station will be using a different spreading code.

In US-A-5101501 a CDMA system is described which uses "soft" handoff. With soft handoff, a mobile station is capable of communicating with more than one base station at the same time. This will typically occur when the mobile station is close to the boundary defined between two cells. The signals sent by the mobile stations will be received and processed by both of the base stations. Likewise, the mobile station will receive the same signal from the two base stations. The signals from the two base stations may be combined.

US-A-5265119 discloses a method of controlling the power of a mobile station which is in communication with two or more base stations at the same time. Each base station which is in communication with the mobile station sends power control

commands to the mobile station. These power control commands will instruct the mobile station to increase or reduce the power with which it transmits signals to the base station. If a mobile station is in communication with more than one base station at the same time, the mobile station may receive conflicting power control commands from different base stations. Accordingly, the mobile station will only increase its transmission power if all the base stations which are in communication with the mobile station instruct the mobile station to increase its transmission power. The mobile station will decrease its transmission power if any one or more of the base stations which are in communication with the mobile station instruct the mobile station to reduce its transmission power.

However this approach has some problems. In particular, in order to be able to use this technique, the transmitter power control commands must be sent to the mobile station from the base station without any unnecessary delays. This is because the power control commands provided by the base station are determined based on the strength of signals received from the mobile station at the base station. In an environment which is changing quickly, the power control commands from the base station must be received by the mobile station before the environment has changed significantly if the power control commands are to be effective. In other words for effective power control the environment should change little during the time taken for a signal transmitted by the mobile station to be received by the base station, the power control command to be generated by the base station from the strength of the received signal and for the power control command to be transmitted to and received by the mobile station.

To avoid unnecessary delays, the power control commands are not error protected or only relatively weakly error protected. This means that there is a significant probability that there is an error in the power control command received at the mobile station. An error in the power control command may result in the mobile station increasing or decreasing its transmission power in

error. Over time, the errors caused by the power control command being incorrectly received by the mobile station will result in the energy per bit to noise (Eb/No) ratio unnecessarily varying. In an interference sensitive system such as CDMA, this may adversely affect the quality of communications and/or the capacity of the system.

It has been proposed that the reliability of the power control commands be estimated and that the mobile station only respond to reliable commands. The method which has been proposed to estimate the reliability of the power control commands uses signal to interference ratio (SIR) information. In particular the signal to interference ratio of other signals received by the mobile station from the base station in question is determined. If the ratio exceeds a given threshold, then the power control command from the base station in question is determined to be reliable. If the ratio falls below the threshold, then the power control command from the base station in question is determined to be unreliable and is ignored by the mobile station.

This method has the problem that this method relies on the set threshold for the signal to noise ratio to determine if the power control command is or is not reliable. This may result in accurately received power control commands being ignored.

SUMMARY OF THE INVENTION

It is an aim of embodiments of the present invention to provide a improved method for determining the reliability of power control commands received at, for example, mobile stations.

According to one aspect of the present invention, there is provided a method of controlling the power with which a first station transmits signals to a second station, comprising the steps of: transmitting from the second station to the first station a power control command having a given value; receiving said power control command at said first station; determining